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ABSTRACT

This paper presents the preliminary results on the costs of electronic journals and compares them to the costs of traditional print journals. The "Chicago Journal of Theoretical Computer Science" (CJTCS) is used as a model and the direct costs incurred in publishing are compared with direct costs incurred for an issue of the same length of the electronic journal, "Neural Computation." Results indicate that the direct costs of publishing an electronic journal are substantially below that of a print journal with the same number of pages. The overhead costs, however, are much higher--1240% higher in this case--but that is adversely affected by the small amount of content published in CJTCS over the course of 18 months of overhead costs compared with NC which published 12 issues over the same period of time. The disparity in the markets for electronic products and print products is, at this point, a very big obstacle to their financial viability, as is also the reluctance on the part of the author community to submit material. (AEF)

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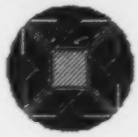

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Session #1 Economics of Electronic Publishing: Cost Issues

Comparing Electronic Journals to Print Journals: Are There Savings?

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Comparing Electronic Journals to Print Journals: Are There Savings?

Three years ago the rhetoric of academics and librarians alike urged publishers to get on with it -- to move their publications from print to electronic formats. The relentless pressure on library budgets from annual increases of ten to twenty percent in serials prices made many look to electronic publication as the savior that would allow librarians to retain their role in the scholarly communication chain. Academics and university administrators were urged to start their own publications and take back ownership of their own research. The future role of the publisher was questioned: What did they do after all? Since so many scholars were now creating their own

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works on computer, why couldn't they just put them up on the Net? Who needs proofreading, copyediting, and design anymore? And since technology has made it possible for everyone to become a publisher, surely electronic publication would be cheaper than print.

There have been quite a few experiments in the last three years trying to answer some of the questions posed by the emergence of the Internet, but few have yielded hard numbers to date. Most have been focused on developing electronic versions of print products, and some of those will be discussed by others at this conference. MIT Press took a piece of the puzzle that we saw as important in the long run and within the capabilities of a university-based journal publisher with space and staff constraints. Many of our authors had been using e-mail, listserves, discussion groups, etc. for ten years or more, and we wanted to be visible on the Internet early.

We decided it was easier, cheaper, and less of a financial risk to try publishing a purely electronic journal rather than reengineering our production and delivery process for our print journals when we had so little feedback about what authors and customers really wanted. Starting with *Chicago Journal of Theoretical Computer Science* (CJTCS), which was announced in late 1994 and which began publication in June of 1995, we began publishing our first purely electronic journal. CJTCS, as well as *Journal of Functional and Logic Programming* (JFLP) and *Journal of Contemporary Neurology* (JCN), are published article-by-article. We ask subscribers to pay an annual subscription fee, but we have not yet installed elaborate mechanisms to ensure that only those who pay have access to the full text. *Studies in Nonlinear Dynamics and Econometrics* (SNDE), begun in 1996, is published quarterly in issues with the full text password protected. Another issue-based electronic journal -- *Videre: Journal of Computer Vision Research* -- will begin publishing this summer. You can view these publicatons at our web site (http://www-mitpress.mit.edu/).

The lack of one format for all material available in electronic format has been a problem for these electronic journals and our production staff. The publication format varies from journal to journal based on several criteria:

the format most often received from authors

the content of the material (particularly math, tables, special characters)

cost to implement

availability of appropriate browser technology

CJTCS and JFLP are published in LaTeX and PostScript, in addition to PDF (Adobe's Portable Document Format) which was added in 1997. JCN is published in PDF and HTML (Hypertext Markup Language, the language of the World Wide Web) because the PostScript files were too large to be practical. SNDE is published in PostScript and PDF. Videre will be published in PDF.

Here I will be presenting our preliminary results on the costs of electronic only journals and comparing them to the costs of traditional print journals. I will be using *Chicago Journal of Theoretical Computer Science* as the model but will include relevant information from our experience with our other electronic journals.

Background on the Project

CJTCS was announced in fall of 1994 and began publication in June of 1995. Material is forwarded to us from the editor once the review process and revisions have been completed. Four articles were published from June through December of 1995, and six articles were published in 1996. (See appendix 1 for list of articles published.) The web site is hosted at the University of Chicago, with entry from the MIT Press web site. The production process includes the following steps:

copyediting

return of copyedited manuscript to author

author's response goes back to copyeditor

final copyedited article goes to "typesetter"

typesetter enters edits/tagging/formatting

proofreading

author sees formatted version

typesetter makes final corrections

article is published (i.e., posted on the site)

Tagging and "typesetting" has been done by Michael J. O'Donnell, Managing Editor of CJTCS who is a professor at University of Chicago.

The subscription price is $30/year for individuals and $125/year for institutions. When an article is published, subscribers receive an e-mail message announcing its publication. Included is the title, the author, the abstract, the location of the file, and the articles published to date in the volume. Articles are numbered sequentially in the volume (e.g., 1996-1, 1996-2). Individuals and institutions are allowed to use the content liberally, with permission to do the following posted on the Web site:

- read articles directly from the official journal servers, or from any other server that grants you access
- copy articles to your own file space for temporary use
- form your own permanent archive of articles, which you may keep even after your subscription lapses
- display articles in the ways most convenient to you (on your computer, printed on paper, converted to spoken form, etc.)
- apply agreeable typographical styles from any source to lay out and display articles

- apply any information retrieval, information processing, and browsing software from any source to aid your study of articles
- convert articles to other formats from the LaTeX and PostScript forms on the official servers
- share copies of articles with other subscribers
- share copies of articles with nonsubscribing collaborators as a direct part of your collaborative study or research

Library subscribers may also:

- print individual articles and other items for inclusion in your periodoical collection or for placing on reserve at the request of a faculty member
- place articles on your campus network for access by local users, or post article listings and notices on the network
- share print or electronic copy of articles with other libraries under standard interlibrary loan procedures

In February 1996, Michael O'Donnell installed a HyperNews feature to accompany each article which allows readers to give feedback on articles. Forward pointers, which were planned to update the articles with appropriate citations to other material published later, have not yet been instituted. Although the editors originally envisioned these features as very important to readers, no questions or comments about the articles have been posted to date.

Archiving arrangements were made with (1) the MIT Libraries, which is creating archival microfiche and archiving the PostScript form of the files; (2) MIT Information Systems, which is storing the LaTeX source on magnetic tape and refreshening it periodically; and (3) the Virginia Polytechnic Institute Scholarly Communications Project, which is mirroring the site (http://scholar.lib.vt.edu/).

Direct Costs of Publication

To date, CJTCS has published ten articles with a total of 244 pages. I have chosen to compare the direct costs we have incurred in publishing those 244 pages with the direct costs we incurred for a 244-page issue (Volume 8, Number 5, July 1996) of another of our journals, *Neural Computation* (NC). NC has a print run of approximately 2000 copies, and typesetting is done from LaTeX files supplied by the authors (as is the case for CJTCS):

	CJTCS	NC	% Difference
Copyediting/Proofreading	$ 1,114	$ 1,577	+ 42%
Composition	$ 2,070	$ 3,914	+ 89%
Printing & Binding	--	$ 6,965	---
Total Production Cost	$ 3,184	$12,456	+291%

Composition Cost/Page	$ 8.48	$ 16.24	+ 92%
Total Production Cost/Page	$ 13.05	$ 51.05	+291%

Important differences in production processes that affect these costs are:

1. The number of articles published (ten in CJTCS, 12 in NC).

2. The copyeditor handles author queries for NC and bills us hourly. This contributed $100 to the copyediting bill.

3. Composition for CJTCS is done on a flat fee basis of $200. Tagging and formatting has been done by Michael O'Donnell, the journal's Managing Editor at University of Chicago, because we were unable to find a traditional vendor willing to tag on the basis of content rather than format. The $200 figure was developed in conjunction with a LaTeX coding house we planned to use initially but which was unable to meet the journal's schedule requirements. In comparison, the cost per article for NC is approximately $326, which includes a $58/article charge for producing repro pages to send to the printer and a $21/article charge for author alteration charges. These are not included on the CJTCS composition bills.

The overhead costs associated with CJTCS and this issue of *Neural Computation* vary greatly. Overhead for our print journals is allocated on the following basis:

- Production -- charged to each journal based on the number of issues published

- Circulation -- charged to each journal based on the number of subscribers, the number of issues published, whether the journal has staggered or non-staggered renewals, and whether copies are sold to bookstores and newsstands

- Marketing/General and Administrative -- divided evenly among all journals.

For CJTCS, the Press incurs additional overhead costs associated with the Digital Projects Lab (DPL). These include the cost of staff, and hardware and software associated with the Press's World Wide Web server. These are allocated to each electronic publication on the following basis:

- Cost of hardware and software for the fileserver, network drops, staff time spent maintaining the server, etc., allocated to each e-journal based on the percentage of disk space the journal files occupy as a function of all web-related files on our server

- Amount of time per issue or article that DPL staff work on the journal times the rate per hour of staff

A comparison of overhead costs associated with CJTCS and this issue of *Neural Computation* shows:

	CJTCS	NC 8:5

Journals Department		
Production	$ 8,000	$ 1,000
Fulfillment Cost Per Subscriber	$ 108	1
General and Administrative	$ 31,050	$ 2,300
Digital Projects Lab		
Staff	$ 200	--
Hardware and Software	$ 5,000	--
Total Overhead Per Subscriber	$ 44,358	$ 3,301
OH costs per page published	$ 182	$ 14

For comparison, below are the direct costs associated with three other electronic journals to date: *Journal of Contemporary Neurology* (JCN), *Journal of Functional and Logic Programming* (JFLP), and *Studies in Nonlinear Dynamics and Econometrics* (SNDE).

	# Pages	# Articles/Issues	Direct Costs	Cost/Pg
JCN	34	6 articles	$ 1666	$ 49.00
JFLP	280	7 articles	$ 2204	$ 7.87
SNDE	152	2 issues	$ 4184	$ 27.53

JCN's cost/page is much higher than the other e-journals because the typesetter produces PDF and HTML formats and deals wtih complex images. It also takes additional time from our Digital Projects Lab staff because of the HTML coding and linking of illustrations, which adds an additional $7.00 per page to its costs. The total cost per page for JCN is, therefore, in line with our print journals even though there is no printing and binding expense.

The issue-based electronic journal *Studies in Nonlinear Dynamics and Econometrics* (SNDE) is comparable in direct costs with a standard print journal, with the only difference being the lack of printing and binding costs. Below is a comparison of the direct costs incurred for SNDE 1:1 (76 pages) and an 80-page issue of one of our print journals, *Computing Systems* (COSY), that follows a similar production path:

	SNDE 1:1	COSY 8:4
Copyediting/Proofreading	$ 551	$ 554
Composition	$ 1,383	$ 1,371
Printing and Binding	$ --	$ 6,501
Total Production Cost	$ 1,934	$ 8,426
Comp Per Page	$ 18.20	$ 17.57

Total Production Cost Per Page	$ 25.44	$ 105.33

Composition cost per page is comparable in these journals, but the total production cost per page of SNDE is only 24% of that of COSY which includes the printing and binding costs associated with a 6000-copy print run. The overhead costs, however, are higher for the electronic journal because of the addition of $1,400 per issue in indirect costs incurred for the staff, hardware, and software in the Digital Projects Lab.

Market Differences

The other side of the picture is whether the market reacts similarly to electronic only products. Since this question is outside the scope of this paper, I will only generalize here from our experience to date. For the four electronic journals we have started, the average paid circulation to date is approximately 100, with 20 to 40 of those being institutional subscriptions. For the two print journals we started in 1996 (both in the social sciences), the average circulation at the end of their first volumes (1996) was 550, with an average of 475 individuals and 75 institutions. There appears to be a substantial difference in the readiness of the market to accept electronic only journals at this point, as well as reluctance on the part of the author community to submit material. It is, therefore, more difficult for the publisher to reach break even with only one-fifth of the market willing to purchase, unless subscription prices are increased substantially. Doing this would likely dampen the paid subscriptions even more.

Conclusion

From the comparison between CJTCS and *Neural Computation*, it seems that the direct costs of publishing an electronic journal are substantially below that of a print journal with comparable pages. The overhead costs, however, are much higher -- 1240% higher in this case -- but that is adversely affected by the small amount of content published in CJTCS over the course of 18 months of overhead costs compared with NC which published 12 issues over the same period of time. The disparity in the markets for electronic products and print products is, at this point in time, a very big obstacle to their financial viability, as is also the conservatism of the author community.

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For additional information about the conference, or The Andrew W. Mellon Foundation's scholarly communication initiatives, please contact Richard Ekman. For additional information about ARL or this web site contact Patricia Brennan, ARL Program Officer at (202) 296-2296.

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